

CLAIMS

1. An optical switch, comprising:
 - a light barrier having a surface between sides;
 - a first light transmitting medium having one or more ridges that each define a portion of an output waveguide, the light transmitting medium positioned such that at least one of the ridges is positioned over the surface of the light barrier; and
 - a second light transmitting medium positioned adjacent to the sides of the light barrier.
2. The switch of claim 1, wherein the first light transmitting medium and the second light transmitting medium are the same material.
3. The switch of claim 1, wherein the first light transmitting medium and the second light transmitting medium are silicon.
4. The switch of claim 1, wherein a width of the light barrier is larger than 150% of a width at a base of the ridge.
5. The switch of claim 1, wherein a width of the light barrier is less than 150% of a width at a base of the ridge.
6. The switch of claim 1, wherein a width of the light barrier is less than 140% of a width at a base of the ridge.
7. The switch of claim 1, wherein a width of the light barrier is less than 130% of a width at a base of the ridge.
8. The switch of claim 1, wherein a width of the light barrier is less than 120% of a width at a base of the ridge.

9. The switch of claim 1, further comprising a modulator configured to modulate light signals carried by the output waveguide.

10. The switch of claim 1, further comprising a switching element configured to direct light signals away from the output waveguide.

11. The switch of claim 1, wherein the second light transmitting medium has an index of refraction equal to or greater than an index of refraction of the first light transmitting medium.

12. The switch of claim 1, further comprising:
a first doped region positioned in the ridge and a second doped region adjacent to the ridge.

13. The switch of claim 1, further comprising:
a first electrical contact positioned over the ridge and a second electrical contact positioned adjacent to a side of the ridge.

14. The switch of claim 1, further comprising:
a first doped region positioned in the ridge and a second doped region adjacent to the ridge; and
a first electrical contact positioned over the first doped region and a second doped region positioned over the second doped region.

15. The switch of claim 1, further comprising:
a first doped region positioned in the ridge and a second doped region positioned under the ridge.

16. The switch of claim 1, further comprising:
a first electrical contact positioned over the ridge and a second electrical contact positioned under the ridge.

17. The switch of claim 1, further comprising:
a first doped region positioned in the ridge and a second doped region under the ridge; and
a first electrical contact positioned over the first doped region and a second doped region positioned over the second doped region.

18. An optical switch, comprising:
a light barrier having a surface between sides;
a first light transmitting medium having one or more ridges that each define a portion of an input waveguide, the light transmitting medium positioned such that at least one of the ridges is positioned over the surface of the light barrier; and
a second light transmitting medium positioned adjacent to the sides of the light barrier.

19. The switch of claim 18, wherein the first light transmitting medium and the second light transmitting medium are the same material.

20. The switch of claim 18, wherein a width of the light barrier is larger than 150% of a width at a base of the ridge.

21. The switch of claim 18, wherein a width of the light barrier is less than 150% of a width at a base of the ridge.

22. The switch of claim 18, wherein a width of the light barrier is less than 140% of a width at a base of the ridge.

23. The switch of claim 18, wherein a width of the light barrier is less than 130% of a width at a base of the ridge.

24. The switch of claim 18, wherein a width of the light barrier is less than 120% of a width at a base of the ridge.

25. The switch of claim 18, wherein the second light transmitting medium has an index of refraction that is greater than or equal to an index of refraction of the first light transmitting medium.

26. An optical switch comprising:

an input waveguide; and

a plurality of output waveguides in optical communication with the input waveguide, one of the output waveguides configured so as to shift a light signal from the input waveguide toward a center of another output waveguide before the light signal the other output waveguide.

27. The switch of claim 26, further comprising:

a switching element configured to direct the light signal to an output waveguide selected from among the plurality of output waveguides.

28. The switch of claim 27, wherein the switching element is not configured to direct the light signal to the output waveguide that is configured such that the light signal is centered.

29. The switch of claim 26, wherein each of the output waveguides branches off of the input waveguide at the same location along the input waveguide.

30. The switch of claim 26, wherein the plurality of output waveguides share a region of the switch and the shared region of the switch is symmetrical about an axis that is parallel to a direction of propagation of light signals traveling along the input waveguide at a location where the input waveguide meets the shared region.

31. The switch of claim 26, wherein each of the output waveguides the input waveguide are defined in a light transmitting medium positioned over a base.

32. The switch of claim 26, wherein the output waveguide that is configured such that the light signal is centered includes a terminal end angled at less than ninety degrees relative to a direction of propagation of light signals traveling along the output waveguide.

33. The switch of claim 26, wherein light signals carried in two output waveguides are combined on a common waveguide, one of the two output waveguides being the waveguide configured such that a light signal is centered.

34. The switch of claim 33, wherein the length of the two output waveguides are selected such that destructive interference occurs on the common waveguide between at least a portion of the light signals carried on each of the two output waveguides.

35. The switch of claim 34, further comprising:
an effective length tuner configured to change the effective length of an output waveguide, the effective length tuner positioned on a waveguide selected from the group consisting of the two output waveguides.

36. An optical switch comprising:
a plurality of active output waveguides;
a switching element configured to direct a light signal to an active output waveguide selected from among the plurality of active output waveguides; and
one or more secondary output waveguides configured to receive a portion of the light signal when the light signal is directed toward an active output waveguide.

37. The switch of claim 36, wherein the plurality of active output waveguides and the one or more secondary output waveguides are each in optical communication with an input waveguide.

38. The switch of claim 36, wherein each of the plurality of active output waveguides and the one or more secondary output waveguides each branch off of the input waveguide at the same location along the input waveguide.

39. The switch of claim 36, wherein the plurality of active output waveguides and the one or more secondary output waveguides share a region of the switch and the shared region of the switch is symmetrical about an axis that is parallel to a direction of propagation of light signals traveling along the input waveguide at a location where the input waveguide meets the shared region.

40. The switch of claim 36, wherein each of the active output waveguides and the secondary output waveguides are defined in a light transmitting medium positioned over a base.

41. The switch of claim 36, wherein one of the one or more secondary output waveguides has a shape that centers light signals relative to one of the active output waveguides.

42. The switch of claim 36, wherein the switching element is not configured to direct light signals to the one or more secondary output waveguides.

43. The switch of claim 36, wherein the secondary output waveguide includes a terminal end angled at less than ninety degrees relative to a direction of propagation of light signals traveling along the secondary output waveguide.

44. The switch of claim 36, wherein light signals carried in an active output waveguide and light signals carried in a secondary output waveguides are combined on a common waveguide.

45. The switch of claim 44, wherein the length of the secondary output waveguide and the active output waveguide are selected such that destructive interference results on the common waveguide between the light signals carried on the active output waveguide and the light signals carried on the secondary output waveguide.

46. The switch of claim 44, further comprising:
an effective length tuner configured to change the effective length of a waveguide, the effective length tuner positioned on a waveguide selected from a group consisting of the active output waveguide and the second output waveguide.

47. An optical switch comprising:
a plurality of active output waveguides in optical communication with an input waveguide;
one or more secondary output waveguides in optical communication with the input waveguide; and
a switching element configured to direct light signals to an output waveguide that is selectable from among only the active output waveguides.

48. The switch of claim 47, wherein each of the plurality of active output waveguides and the one or more secondary output waveguides each branch off of the input waveguide at the same location along the input waveguide.

49. The switch of claim 47, wherein the plurality of active output waveguides and the one or more secondary output waveguides share a region of the switch and the shared region of the switch is symmetrical about an axis that is parallel to a direction of propagation of light signals traveling along the input waveguide at a location where the input waveguide meets the shared region.

50. The switch of claim 47, wherein one of the one or more secondary output waveguides has a shape that centers light signals relative to one of the active output waveguides.

51. The switch of claim 47, wherein the secondary output waveguide includes a terminal end angled at less than ninety degrees relative to a direction of propagation of light signals traveling along the secondary output waveguide.

52. The switch of claim 47, wherein light signals carried in an active output waveguide and light signals carried in a secondary output waveguides are combined on a common waveguide.

53. An optical switch, comprising:
a first output waveguide in optical communication with an input waveguide
a second output waveguide in optical communication with the input waveguide;
a switching member configured to direct light signals to the first output waveguide or the second output waveguide; and
a third output waveguide in optical communication with the input waveguide, the third output waveguide configured to receive a portion of each light signal directed to the second output waveguide.

54. The switch of claim 53, wherein the third output waveguide is configured such that the light signals are centered relative to the second output waveguide.

55. The switch of claim 53, wherein each of the output waveguides branch off of the input waveguide at the same location along the input waveguide.

56. The switch of claim 53, wherein each of the output waveguides share a region of the switch and the shared region is symmetrical about an axis that is parallel to a direction of propagation of light signals traveling along the input waveguide at the location where the input waveguide meets the shared region.

57. The switch of claim 53, wherein the switching element is not configured to direct light signals to the third output waveguide.

58. The switch of claim 53, wherein the third output waveguide includes a terminal end angled at less than ninety degrees relative to a direction of propagation of light signals traveling along the third output waveguide.

59. The switch of claim 53, wherein light signals carried in the first output waveguide and the second output waveguide are combined on a common waveguide.

60. The switch of claim 59, wherein the length of the first output waveguide and the length of the second output waveguide are selected such that destructive interference results on the common waveguide between the light signals carried on the first output waveguide and the light signals carried on the second output waveguide.

61. The switch of claim 59, further comprising:

an effective length tuner configured to change the effective length of a waveguide, the effective length tuner positioned on a waveguide selected from a group consisting of the first output waveguide and the second output waveguide.

62. An optical switch, comprising:

a plurality of output waveguides in optical communication with one or more input waveguides; and

a modulator configured to modulate light signals being carried by a first output waveguide, the first output waveguide being one of the plurality of output waveguides.

63. The switch of claim 62, wherein the one or more input waveguides and the one or more output waveguides are formed in a light transmitting medium positioned over a base.

64. The switch of claim 62, wherein one or more of the plurality of output waveguides is in optical communication with a common waveguide, the common waveguide being in optical communication with other optical switches.

65. The switch of claim 64, wherein two output waveguides are in optical communication with the common waveguide.

66. The switch of claim 64, wherein the first output waveguide is in optical communication with the common waveguide.

67. The switch of claim 62, further comprising:
a light sensor configured to convert the light signals carried by the first output waveguide into electrical signals.

68. The switch of claim 67, further comprising:
electronics for separating a modulated portion of the electrical signals from a remainder of the electrical signals, the modulated portion resulting from operation of the modulator.

69. The switch of claim 62, further comprising:
a switching element configured to direct the light signal from an input waveguide to one of the output waveguides.

70. The switch of claim 62, wherein the switch includes three output waveguides.

71. The switch of claim 70, further comprising:
an effective length tuner configured to change the effective length of one of the three output waveguides.

72. The switch of claim 70, wherein the intersection of the three output waveguide is symmetrical about a longitudinal axis of a center waveguide of the three output waveguides.

73. An optical switch, comprising:

a switching element configured to direct light signals to at least one of a plurality of output waveguides; and

a modulator configured to modulated light signals carried by a first output waveguide, the first output waveguide being one of the plurality of output waveguides.

74. The switch of claim 73, wherein one or more of the plurality of output waveguides is in optical communication with a common waveguide, the common waveguide being in optical communication with other optical switches.

75. The switch of claim 74, wherein two output waveguides are in optical communication with the common waveguide.

76. The switch of claim 74, wherein the first output waveguide is in optical communication with the common waveguide.

77. The switch of claim 73, further comprising:

a light sensor configured to convert the light signals carried by the first output waveguide into electrical signals.

78. The switch of claim 77, further comprising:

electronics for separating a modulated portion of the electrical signals from a remainder of the electrical signals, the modulated portion of the electrical signals resulting from operation of the modulator.

79. An optical switching architecture, comprising:
a plurality of optical switches, each optical switch having a plurality of output waveguides;
a common waveguide in optical communication with a first output waveguide from each of the optical switches; and
a plurality of modulators, each modulator configured to modulate the light signals carried by one of the first output waveguides.

80. The switching architecture of claim 79, wherein each switch includes two output waveguides in optical communication with the common waveguide.

81. The switching architecture of claim 79, further comprising:
a light sensor configured to convert the light signals carried by the common waveguide into electrical signals.

82. The switching architecture of claim 81, further comprising:
electronics for separating an modulated portion of the electrical signals from a remainder of the electrical signals, the modulated portion of the electrical signals resulting from operating one or more of the modulators.

83. The switching architecture of claim 81, further comprising:
electronics for separating a modulated portion of the electrical signals from the remainder of the electrical signals, the modulated portion of the electrical signals resulting from operating a particular one of the modulators.

84. The switching architecture of claim 79, wherein each switch includes three output waveguides.

85. The switching architecture of claim 79, wherein two of the three output waveguides are in optical communication with the common waveguide.

86. A method for operating a switch, comprising:
directing light signals toward at least one of a plurality of output waveguides;

modulating light signals carried on a first output waveguide, the first output waveguide being one of the plurality of output waveguides.

87. The method of claim 86, further comprising:
operating the modulator when light signals are directed toward the first output waveguide and not operating the modulator when the light signals are directed toward any other waveguide other than the first output waveguide.

88. The method of claim 86, further comprising:
operating the modulator when the light signals are directed toward an output
side other than the first output waveguide and not operating the modulator
when the light signals are directed toward the first output waveguide.

89. The method of claim 86, further comprising:
operating the modulator with a first modulation signals when light signals are directed toward the first output waveguide and operating with a second modulation signal when the light signals are directed toward an output waveguide other than the first output waveguide.

90. The method of claim 86, further comprising:
receiving the light signals carried on the first output waveguide on a common
side, the common waveguide being in optical communication with other
switches.

91. The method of claim 86, further comprising:

receiving the light signals carried on the first output waveguide at a light sensor configured to convert the light signals to electrical signals.

92. The method of claim 91, further comprising:

separating a modulated portion of the electrical signals from an unmodulated portion of the electrical signals, the modulated portion of the electrical signals resulting from modulation of the electrical signals carried on the first output waveguide.

93. The method of claim 92, further comprising:

processing the modulated portion of the electrical signal independent of the unmodulated portion of the electrical signal.

94. The method of claim 92, further comprising:

processing the unmodulated portion of the electrical signal independent of the modulated portion of the electrical signal.

95. The method of claim 91, further comprising:

separating a modulated portion of the electrical signals from the remainder of the electrical signals, the separated portion of the electrical signals resulting from operation of the switch.

96. The method of claim 86, wherein modulating the electrical signals

includes encoding the light signals carried on the first output waveguide.

97. The method of claim 96, further comprising:
converting the encoded light signals to electrical signals; and
decoding an encoded portion of the electrical signals, the encoded portion of the electrical signals resulting from converting the encoded portion of the light signals to electrical signals.

98. A method of operating a switch, comprising:
converting light signals carried on a common waveguide to electrical signals, the common waveguide receiving the light signals from a plurality of optical switches; and
separating a modulated portion of the electrical signals from the remainder of the electrical signals, the modulated portion of the electrical signals resulting from the light signals from one or more of the optical switches being modulated before entering the common waveguide.

99. The method of claim 98, wherein separating the modulated portion of the electrical signals includes separating the portion of the electrical signals that result from modulation the light signals from a particular one of the optical switches.